AMENDMENTS TO THE CLAIMS

1. (Previously amended) A shaft for the transmission of torsional loads, the shaft comprising:

an elongated inner tube member having opposing open ends;

at least one end piece located adjacent at least one end of the inner tube member; said end piece including a knurled exterior surface,

a composite material covering the inner tube member and at least a portion of the end piece; said composite material mechanically connected to said knurled exterior surface, and

wherein the portion of the end piece covered by the composite material defines a convexly curved area of the end piece.

2. (Original) The shaft of claim 1 wherein the composite material includes elongated fibers, and the fibers are oriented at an angle which satisfies the condition that the angle of twist of the inner tube at failure equals the angle of twist of the composite material at failure.

3. (Previously presented) The shaft of claim 1 wherein the composite material includes elongated fibers, and substantially all of the fibers are oriented at a single angle which satisfies the conditions that the shaft have a first natural frequency greater than a predetermined maximum rotational operating speed, the shaft have a maximum operating

torque strength which exceeds a predetermined operating torque, and the angle of twist of the inner tube at failure equals the angle of twist of the composite material at failure.

4. (Previously amended) The shaft of claim 1 wherein an end piece is provided at each end of the shaft, each end piece including a knurled exterior surface.

5. (Original) The shaft of claim 4 wherein torsional loads are transmitted from the end pieces to the composite material through multiple load paths.

6. (Previously presented) The shaft of claim 5 wherein the multiple load paths comprise a direct connection between the end pieces and the composite material, and a connection from the end pieces to the inner tube and a connection from the inner tube to the composite material.

7. (Original) The shaft of claim 1 wherein the composite material includes elongated fibers which are oriented relative to the curvature of the portion of the end piece covered by the composite material such that, in the area of the portion of the end piece covered by the composite material, shear loads in the composite material are transferred longitudinally along the length of the fibers.

8. (Original) The shaft of claim 7 wherein the portion of the end piece covered with the composite material defines a geodesic isotensoid elliptical shape derived with reference to the angle of the fibers.

9. (Original) The shaft of claim 1 wherein the inner tube comprises a mandrel used in forming the composite material on the shaft.

10. (Original) The shaft of claim 9 wherein an end piece is provided at each end of the shaft and the inner tube provides alignment between the end pieces during formation of the shaft.

11. (Original) The shaft of claim 1 further including a sacrificial layer covering the composite material.

12. (Previously presented) The shaft of claim 11 wherein the sacrificial layer comprises a layer thinner than the composite material, and includes fibers oriented at approximately 90 degrees relative to the elongated inner tube member.

13. (Previously amended) A shaft for the transmission of torsional loads, the shaft comprising:

an elongated inner tube member;

an end piece located adjacent each end of the inner tube member;

a composite material covering the inner tube member and at least a portion of each of the end piece; said composite material mechanically attached to said end piece, and

wherein the composite material includes elongated fibers and the portions of the end pieces covered with the composite material defines a geodesic isotensoid elliptical shape derived with reference to the angle of the fibers such that, in the area of the portions of the end pieces covered by the composite material, shear loads in the composite material are transferred longitudinally along the length of the fibers.

14. (Previously presented) The shaft of claim 13 wherein substantially all of the fibers are oriented at a single angle which satisfies the conditions that the shaft have a first natural frequency greater than a predetermined maximum rotational operating speed, the shaft have a maximum operating torque strength which exceeds a predetermined operating torque, and the angle of twist of the inner tube at failure equals the angle of twist of the composite material at failure.

15. (Original) The shaft of claim 13 wherein torsional loads are transmitted from the end pieces to the composite material through multiple load paths.

16. (Previously presented) The shaft of claim 15 wherein the multiple load paths comprise a direct connection between the end pieces and the composite material, and a connection from the end pieces to the inner tube and a connection from the inner tube to the composite material.

17. (Currently amended) A shaft for the transmission of torsional loads, the shaft comprising:

an elongated inner tube member having opposing open ends;

at least one end piece located adjacent at least one end of the inner tube member;

a composite material covering the inner tube member and at least a portion of the end piece<u>, said composite material including elongated fibers wound about the inner tube member and end piece in a geodesic isotensoid manner</u> ; and

wherein the portion of the end piece covered by the composite material defines a convexly curved area of the end piece, said shaft being open ended at both ends.

18. (Previously presented) The shaft of claim 17 wherein the composite material includes elongated fibers, and the fibers are oriented at an angle which satisfies the condition that the angle of twist of the inner tube at failure equals the angle of twist of the composite material at failure.

19. (Previously presented) The shaft of claim 1 wherein the composite material includes elongated fibers, and substantially all of the fibers are oriented at a single angle which satisfies the conditions that the shaft have a first natural frequency greater than a predetermined maximum rotational operating speed, the shaft have a maximum operating torque strength which exceeds a predetermined operating torque, and the angle of twist of the inner tube at failure equals the angle of twist of the composite material at failure.

20. (Previously presented) The shaft of claim 17 wherein said end piece includes a knurled exterior surface, said composite material mechanically connected to said knurled exterior surface.

AMENDMENTS TO THE SPECIFICATION

Amend paragraph [0024] as follows:

[0024] It should also be noted that the construction of the present shaft 10, as illustrated in Fig. 5, provides improved load transfer characteristics for transferring torque loads between the opposing end pieces 14, 16. Specifically, multiple load paths are defined between the end pieces 14, 16. A first load path comprises the connection 44 between the composite material ~~12~~ 18 and the end pieces 14, 16, which is facilitated by the knurled surfaces 21, 23 to form a rigid connection after the wet or uncured composite material is deposited within the grooves of the knurled surfaces 21, 23 and cured, locking the hardened composite material 18 to the end pieces 14, 16. A second load path is defined by the connection 46 between the end pieces 14, 16 and the inner tube member 12, at the interface portions 28, 30. A third load path is provided from the inner tube 12 to the composite material 18 via an adhesion layer 48 between the entire exterior surface of the inner tube member and the composite material. It should be noted that the formation of these multiple paths takes place during the operation of forming the tubular composite portion 18 of the shaft, resulting in the application of the composite material to the inner tube member 12 and to the knurled portions of the end pieces 14, 16, such that a further or secondary operation is not required to create a consistent and durable hybrid structure for transfer of torque loads between the end pieces 14, 16.